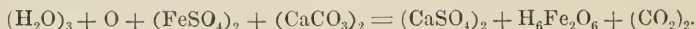


droxidation of the pyrite by reaction with limestone in presence of air thus :



In the region which I have studied, it seems to be as difficult to define any horizon or horizons of hydromica slate as to define an horizon of moisture, or of hard and soft rock. Hydromica slate in the counties before named occurs at any horizon, and in all possible relative positions to the limestone. So far as I have been able to judge the relations of these strata to the limonite, they are twofold : 1st, as a carrier of the pyrites, and perhaps other iron bearing minerals, which by their separation from the other constituents have been washed down and collected in the impervious strata *actually* beneath them. 2d, as the material out of which the impervious clays themselves have been produced.

As to the age of these hydromicas, they appear to be represented in the rocks of several ages. There are some which seem to be intercalated with, and therefore of the same age as the limestone itself.

Some are found geologically beneath the limestone and intercalated among the chlorites, quartzites, and orthofelsites of the South Mountain group.

Crystallography in Sculpture.

BY PERSIFOR FRAZER, JR.

(Read before the American Philosophical Society, January 4, 1878.)

Mr. Spring an artist and a modeler in clay has conceived the ingenious idea of making the human head out of a number of plane surfaces of different area, and he designs these models, less to aid in teaching anatomy than to aid in teaching sculpture.

There are some fifty planes more or less represented on the small models such as this here shown, and of course it is of value to be able to designate each of them by some succinct and comprehensive notation.

It was suggested to Mr. Spring to apply to crystallography for this purpose.

The head here represented is of a high Caucasian type, unless I am deceived, and the symmetry of the features is as striking as their representation by planes is novel.

Of course since a plane represents a certain portion of such variable parts as the flesh, lips, ear, &c., no crystallographic formula would represent the same feature on each of two twins, nor would it represent the same individual in different frames of mind, and states of physical condition, viz.: angry ; sentimental ; after dinner ; after sleep, &c.; nevertheless, a sort of rough approximation to his mean condition will enable if

not every man to get his own crystallographic formula, at least that of his race to be expressed.

It must be borne in mind too that the planes here shown are not absolutely correct, but simply an arbitrary series laid on by that most difficult of all persons to calculate exactitudes from — a skillful artist.

In spite of this (and to give the names rather of the things each individual most nearly resembles than what it actually is, and thus aid the student in deriving and placing them), the following attempt was made :

Even with the most symmetrical human face a slight consideration will convince one that the Triclinic System or the System of Pinacoids is the only one which will serve to represent all the planes; nevertheless the zone of macrodemes require a monoclinic habit : and even this fails in many cases owing to a lack of parallel pairs : so that one is obliged to introduce the somewhat crystallographically confusing notion of a single plane.

Yet the general parameter relations of such a plane and the position which it occupies above, below ; in front, in rear ; right, or left ; being indicated by P, P., ·P, .P for the front (when necessary, adding for the rear P', P', 'P, 'P) its actual position on the model may be sufficiently well known.

Not that this is not found in nature for some calamine and tourmalines have the peculiarity of being asymmetrical or hemimorphic; and instances of a lower termination of one basal plane and an upper one of a pyramid are not rare.

Assuming the upper trapezoid on the model to be the basal plane or 0P of some triclinic prototype, the following represent some of the principal forms represented :

* m $\bar{\infty}$	∞	upper forehead.	} Zone of Macrodemes.
† n \bar{P}	∞	.....	middle frontal.
† q \bar{P}	∞	.....	bridge of nose.
r \bar{P}	∞	.....	middle of upper lip.
s \bar{P}	∞	.....	upper chin.
t \bar{P}	∞	.....	middle chin.
u \bar{P}	∞	.....	under chin.

- 0 \bar{P} Top of head and plane of nostrils.... Basal Pinacoid.
- ∞ \bar{P} ∞ Front and back of neck.....Macropinacoid.
- ∞ \bar{P} ∞ Side planes of neck.....Brachypinacoid.

m·P·	upper skull (4 planes).	} Pyramids.
n·P·	.....	upper skull (4 planes).
q·P·	..side	frontals and lower occiput (4 planes).	
r·P·	..side	occiput and middle cheeks (4 planes).	
t·P·	..side	skull front and above ears (2 planes).	
y·P·	.....	cheeks beside nose (2 planes).

* Represented also in two occipital planes, 3 in all.

† Represented also in one occipital plane, 2 in all.

∞ 'P' $\left\{ \begin{array}{l} \text{Four of neck planes.} \\ \text{also cheek by back jaw and posterior skull by} \\ \text{ear.} \end{array} \right\}$ Prism.

Of course it is understood that m, n, t, r, &c., are simply coefficients by means of which to derive all the forms to which they refer in parameter values from some typical P whose parameter values must be assumed as normal.

The whole object is merely to enable the sculptor to give each plane a name and not entirely an arbitrary one.

On a Series of Chemical Analysis of Siluro-Cambrian Limestone Beds in Cumberland County, Pennsylvania.

BY J. P. LESLEY.

(Read before the American Philosophical Society, December 21, 1877.)

The mixture of magnesia with lime in dolomite rocks has always stimulated and baffled geological speculation, and given birth to opposite hypotheses; some of them, such as that of the issue of magnesium vapors from the interior of the earth, absurd enough; others, such as that recently propounded by Mr. W. L. Green, British Minister at Honolulu, who derives the magnesia from olivine in lava, very suggestive of truth.

I have long felt that no sound basis for speculation had been secured so long as the collection of facts consists merely of analyses of sporadic specimens of limestone and dolomite rocks. I therefore directed Mr. R. H. Sanders, of the Pennsylvania Geological Survey, to make a careful section of the Siluro-Cambrian strata exposed for a quarter of a mile along the west bank of the Susquehanna River, opposite Harrisburg, both by the deep cuttings of the North Pennsylvania Railroad, and by quarries. This was done in connection with his field work in Cumberland County.

Mr. Joseph Hartshorne was also directed to take duplicate samples from every stratum, thick or thin, in this section; one at railway grade, and the other at the top of the exposure (sometimes 30' high); to analyse them in the laboratory of the Survey at Harrisburg. This he has done, and is still doing, devoting his entire time and attention to the selection of the samples *in situ*, and their determination in the laboratory. In all cases of doubt the analyses have been duplicated and sometimes triplicated; and a report of all analyses as fast as made is forwarded to headquarters.

Of the whole conformable series of beds numbered from the topmost (dipping about 30° to the south) No. 1 down to No 98, Mr. Hartshorne has as yet only analysed from No. 1 to No. 46. But the generalization which